JOHN C. LILLY CORRESPONDENCE (Job application etc.)

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Dr. John C. Lilly, Director
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3908 Main Highway
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Dear Dr. Lilly:

(Job application etc.)

Constantine Spyropoulos forwarded your letter to me, and I have deferred a reply until I could find and read your new book.

The excitement over your work which had earlier been roused in me by fragmentary word-of-mouth has now been stabilized at full tilt. The evidence for porpoise intelligence-- though scattered and curious, as you say-- is quite staggering. And the urgency of "getting through," if they are there intellectually to be got through to, is of the utmost importance-- not for any avaricious instrumental reasons, but for the glory and excitement of it.

I have cooked up a few suggestions for this work, on the basis of your book. My thoughts fall under four or five headings: hearing their utterances, imitating their utterances, helping them with English, and setting up proper motivational situations.

It is very important at this stage, ~~where~~ when we are still in the dark about their phonetics, to learn to hear the full range of their utterances-- not just look at them on an oscilloscope. Halving the speed of a tape recording will do the transposition, of course, but it will also cut the timing in half and slow things down uncomfortably. (I can imagine how exasperating it would be trying to learn a human tongue from tape played at half the speed.) I hear from electronic

friends that a tape "slicer" is available, which can delete infinitesimal sections of a recording and thereby shorten it to any length, perhaps its original length-- but that leaves two important problems. First, it does not enable us to hear the whole utterance at one time. Second, it involves playback delay-- which, if it annoys and bores us, should bore even more a skittish dolphin.

The desirable thingx, it seems to me, is not only to transpose the dolphin's utterance, but to compress it, so that the significant frequency range of utterance is gotten all within the compass of human hearing. Furthermore, a real-time apparatus is desirable, one that will allow a dolphin-word to be heard at the moment of utterance, and permit the human to respond promptly.

This is just a thought, but it seems to me that such a machine might be built on the principle of the sound spectrograph. Let us call it the sound spectrum converter. A number of pickups are set up to receive sound from the water. Each of these transmits a signal proportional to the volume of ~~bi~~ vibrations within a given frequency band. They are tuned so as to cover, in regular intervals, the entire frequency spectrum of porpoise utterance. Each channel actuates a noise-maker at the corresponding frequency band of the human "analog" sound spectrum, and the resulting sound goes to the earphones of the man in the pool.

Thix converter has at least four foreseeable disadvantages. First, it might squash the sound spectrum so much that a man could not hear fine distinctions in pitch that might be crucial. Second, it would be better on vowels than on consonants. (If this is a useful distinction.) Third, the accessibility of an entire spectrum might be unnecessary; just as the dolphin seems to imitate our upper squeaks, we might go listen to all the wrong things. However, it would seem proper at the beginning not to lop off any phonetic possibilities. (Furthermore, there is no logical reason that ~~xmx~~ we need attend to the same cues in an utterance that porpoises do. Just as a deaf person notices the position of lips and from various introspectixxions and practice can make himself vocally understood, we might get along listening for what porpoises would consider the wrong things.) Last, a large number of frequency bands would have to be used, perhaps inconveniently large, and there might be difficulties with overtones. It remains to be seen, of course, whether the man in the pool can make decent porpoise sounds, and make out what he hears.

The production of sounds for "talking to" the animals would probably be easier than the listening arrangements. A good human noisemaker, not necessarily a phonetician, would seem to be the most versatile gadget. However, there is no need to get preoccupied with the use of vocal cords. Oscillators,

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operated by hand, might work better for the whistles.

As for trying to teach the dolphins English, it might be well to let them hear human speech only with the upper overtones removed-- at least, until they get the idea of speaking in our register. One way of doing this might be to superimpose human speech on sounds of a low-pitched timbre, much as was done with Casey Jones, the talking train in Disney's "Dumbo."

An interesting inversion of this might be to try the same trick on them that one of them tried on you-- restrict the ranges dolphins may use in talking to each other, by electronically deadening certain frequency ranges on the intercom spectra. (This presupposes that they are satisfactorily communicating with one another over microphones, which I trust is a trick in itself.) Whether they appear to compress the frequency scale involved in their communications when the available range is cut down should be of great interest to us. If they cannot do so, it is an indication that certain pitches in their languages are "locked," and not susceptible of transposition. This would suggest a tonemic scale.

As you have suggested, it would seem likely offhand that any communication-system they might have will contain both phonemes and morphemes. The alternative would be some congeries of phonetic scales which vary only continuously. Perhaps continuous variation is fine for fine shades of meaning, such as by dynamic emphasis in human languages, but this would hardly present imaginable means for carrying cruder base content.

However, the phonemic system, if any, might be something quite different from what we know. For instance, it could lack what might be called "relational closure": unlike most human phonemes, which are recognizable out of context or in any environment, they might be undefined except in relation to certain other sounds-- like tonality in music-- which ~~were~~ are elusive. This might well be the case in a phonemic system which had more options of continuous variation than do ours.

While there is no need to dwell on these adverse possibilities, it might be better to acknowledge them soon than late. The human-- one might best say "lovable"-- characteristics that the porpoise apparently has would seem to offset these apprehensions, though. Things might be much simpler.

A word on motivation. It sounds as though one of the greatest problems is to get the animal interest in the experiment on a long-range basis, emancipated from regular doles of fish. The brain-stimulation hence appears to be a good step. However, if it were possible to rig a situation where two porpoises must cooperate without seeing each other, there might be more effort and more pregnant vocalization. (The same has

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been studied interestingly with people.) Best of all would be a triangular situation-- if two porpoises felt they had to communicate with a human-- to forfend approaching disaster, etc.-- they might really extend themselves. But here it is a problem of plausibly presenting a situation in which the human's interests are the same as theirs, and he is not in control. The smarter they are, the harder they should be to convince.

I hope you have found these thoughts of interest. I certainly have, just as I have been greatly interested in the whole problem. I have solicited letters of recommendation from Messrs. David Riesman and Jerome Bruner, both of Harvard.

I am, with best wishes,

Ted Nelson

Theodor Holm Nelson

P.S. While writing this letter I heard from my mother that she had seen you, and spent a delightful day meeting dolphins. I wish I had been along.

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Curriculum vitae: Theodor Holm Nelson. 12 Sept. 1961

Born: June 17, 1937.
A.B., Philosophy, Swarthmore, 1959.
One year at University of Chicago, Sociology, 1959-60.
One year at Harvard, Social Relations (Sociology,) 1960-1.

Jobs; Copy boy, New York Times, summer 1956
Typist, American Securities Corporation, summer 1959
Computer, National Opinion Research Center, fall 1959
Editor, Laboratory of Social Relations Bulletin,
Laboratory of Social Relations (Harvard,) 1960-1
Coder, Center for the Study of the History of Liberty
in the United States, summer 1961.

Bibliography:
Copious literary and journalistic writings in college,
including three editorships, four plays performed.
Small items in Mademoiselle and American Sociological
Review in 1959.
Article on language and social theory, Laboratory of
Social Relations Bulletin, fall 1960.
Article on bargaining theory, game research, and
interpersonal signalling, in Laboratory of Social
Relations Bulletin, spring 1961.

Special interests:
Structural linguistics (one seminar, Swarthmore;
two courses under Zellig Harris, U. of Pennsylvania.)
Computers, system design and information retrieval.
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